

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

To:

Hooper, Kevin C.
MURGITROYD & COMPANY
Scotland House
165-169 Scotland Street
Glasgow
G5 8PL
GRANDE BRETAGNE

(PCT Rule 44.1)

Date of mailing
(day/month/year)

6 August 2010 (06-08-2010)

Applicant's or agent's file reference
C049105/0303880

FOR FURTHER ACTION

See paragraphs 1 and 4 below

International application No.
PCT/IB2009/007443

International filing date
(day/month/year)

28 October 2009 (28-10-2009)

Applicant

PURSUIT DYNAMICS PLC

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority



European Patent Office, P B 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel (+31-70) 340-2040
Fax (+31-70) 340-3016

Authorized officer

CORNUDET, Veronique
Tel +49 (0)30 25901-712

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|--|--|---|
| Applicant's or agent's file reference C049105 · 0303880 | FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below. | |
| International application No. PCT/IB2009/007443 | International filing date (day/month/year) 28/10/2009 | (Earliest) Priority Date (day/month/year) 30/10/2008 |
| Applicant PURSUIT DYNAMICS PLC | | |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. _____
☐ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention
- b. ☒ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2009/007443

A. CLASSIFICATION OF SUBJECT MATTER

INV. C12P7/10 C12P19/14 B01F3/12 B01F5/04 C12M1/40
 C13K1/06

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C12P B01F C12M C13K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, BIOSIS, COMPENDEX, EMBASE, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|--|
| X | GB 1 028 211 A (ESCHER WYSS GMBH) 4 May 1966 (1966-05-04) page 1, lines 8-73 pages 3-5; figures 1-4; examples 1-3 & GB 995 660 A (ESCHER WYSS GMBH) 23 June 1965 (1965-06-23) page 2, line 9 - page 4, line 94; figures 1-8 | 1-74 |
| X | WO 2006/010949 A1 (PURSUIT DYNAMICS PLC [GB]; FENTON MARCUS BRIAN MAYHALL [GB]; WALLIS AL) 2 February 2006 (2006-02-02) page 1, line 1 - page 2, line 4 page 47, line 28 - page 48, line 32 page 3, line 19 - page 8, line 27; figure 1 | 1-6, 12, 45-49, 57, 58, 63, 64, 72, 73 |

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

I document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

27 July 2010

Date of mailing of the international search report

06/08/2010

Name and mailing address of the ISA

European Patent Office, P.B. 5618 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel: (+31-70) 340-2040
 Fax: (+31-70) 340-3016

Authorized officer

Schröder, Gunnar

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2009/007443

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| X | Cincotta, Bruce: "From the lab to production: direct steam injection heating of fibrous slurries" BIOMASS MAGAZINE 1 July 2008 (2008-07-01), XP002593580 Retrieved from the Internet: URL: http://www.pro-sonix.com/files/Heating_of_Fibrous_Slurries_-_Biomass_Magazine_-_Hyp_0708.pdf [retrieved on 2010-07-22] the whole document | 1-5, 45-49 |
| A | US 4 201 596 A (BURROUGHS REGINALD L [US] ET AL) 6 May 1980 (1980-05-06) * abstract column 1, line 55 - column 5, line 40 | 1 |
| A | US 2003/147301 A1 (EKHOLM ROLF [SE]) 7 August 2003 (2003-08-07) * abstract paragraphs [0001], [00 2], [0 12], [0 15] - [0027]; figure 2 | 1, 48 |
| A | RU 2 152 465 C1 (KAZAKOV VLADIMIR MIKHAJLOVICH) 10 July 2000 (2000-07-10) * abstract; figure 1 | 1, 48 |
| A | KHANAL SAMIR KUMAR ET AL: "Ultrasound enhanced glucose release from corn in ethanol plants" BIOTECHNOLOGY AND BIOENGINEERING, vol. 98, no. 5, December 2007 (2007-12), pages 978-985, XP002593581 ISSN: 0006-3592 * abstract | 1 |
| A | DATABASE FSTA [Online] INTERNATIONAL FOOD INFORMATION SERVICE (IFIS), FRANKFURT-MAIN, DE; 1984, HAGEN H A: "Energy economy by continuous steaming and mashing. (translated) TIOL-Einsparung von Energie durch kontinuierliches Daempfen/Maischen." XP002593582 Database accession no. FS-1984-01-H-0193 * abstract & BRANNTWEINWIRTSCHAFT, vol. 122, no. 18, 1982, pages 282-284, | 7-11 |

-/--

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2009/007443

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|---|
| X,P | <p>WO 2008/135783 A1 (PURSUIT DYNAMICS PLC [GB]; HEATHCOTE JOHN GERVASE MARK [GB]; FENTON MA) 13 November 2008 (2008-11-13)</p> <p>page 1, lines 1-7 page 2, line 28 - page 4, line 28 page 10, line 1 - page 14, line 22; figures 1, 3 page 16, line 5 - page 17, line 17</p> | <p>1-5, 12, 45-49, 57-60, 63-69, 72, 73</p> |
| X,P | <p>WO 2008/135775 A1 (PURSUIT DYNAMICS PLC [GB]; THORUP JENS HAVON [GB]; HEATHCOTE JOHN GERV) 13 November 2008 (2008-11-13)</p> <p>page 1, lines 1-6 page 2, line 27 - page 7, line 4 page 7, line 15 - page 9, line 12; figure 1 page 13, line 19 - page 14, line 3 page 15, line 12 - page 16, line 26</p> | <p>1-11, 13, 16, 45-49, 57-60, 63-69, 72, 73</p> |
| X,P | <p>EP 2 070 881 A1 (APV SYSTEMS LTD [GB]) 17 June 2009 (2009-06-17)</p> <p>paragraph [0009] - paragraph [0017] paragraph [0018] - paragraph [0025] paragraph [0027] - paragraph [0028]</p> | <p>1-5, 45-49, 57, 58, 63, 64, 72, 73</p> |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2009/007443

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|---|----|---------------------|----------------------------|---------------------|
| GB 1028211 | A | 04-05-1966 | CH 399372 A | 15-09-1965 |
| | | | CH 440176 A | 15-07-1967 |
| | | | DE 1567367 A1 | 02-07-1970 |
| | | | DE 1172620 B | 18-06-1964 |
| | | | DE 1190890 B | 08-04-1965 |
| | | | DE 1189030 B | 11-03-1965 |
| | | | GB 995660 A | 23-06-1965 |
| | | | NL 283530 A | |
| | | | NL 7313559 A | 25-01-1974 |
| | | | US 3219483 A | 23-11-1965 |
| | | | US 3308037 A | 07-03-1967 |
| WO 2006010949 | A1 | 02-02-2006 | AU 2005266144 A1 | 02-02-2006 |
| | | | BR PI0513918 A | 20-05-2008 |
| | | | CA 2573712 A1 | 02-02-2006 |
| | | | EP 1789684 A1 | 30-05-2007 |
| | | | JP 2008508462 T | 21-03-2008 |
| US 4201596 | A | 06-05-1980 | AU 526514 B2 | 13-01-1983 |
| | | | AU 5281379 A | 17-07-1980 |
| | | | BR 8000020 A | 07-10-1980 |
| | | | CA 1129355 A1 | 10-08-1982 |
| | | | DE 2944789 A1 | 24-07-1980 |
| | | | FI 793497 A | 13-07-1980 |
| | | | GB 2041376 A | 10-09-1980 |
| | | | IN 151283 A1 | 19-03-1983 |
| | | | JP 1168642 C | 30-09-1983 |
| | | | JP 55092699 A | 14-07-1980 |
| | | | JP 57056880 B | 01-12-1982 |
| | | | NO 793650 A | 15-07-1980 |
| | | | SE 7903001 A | 13-07-1980 |
| US 2003147301 | A1 | 07-08-2003 | NONE | |
| RU 2152465 | C1 | 10-07-2000 | NONE | |
| WO 2008135783 | A1 | 13-11-2008 | CA 2685537 A1 | 13-11-2008 |
| | | | EP 2142658 A1 | 13-01-2010 |
| | | | EP 2145026 A1 | 20-01-2010 |
| | | | WO 2008135775 A1 | 13-11-2008 |
| | | | US 2009240088 A1 | 24-09-2009 |
| WO 2008135775 | A1 | 13-11-2008 | CA 2685537 A1 | 13-11-2008 |
| | | | EP 2142658 A1 | 13-01-2010 |
| | | | EP 2145026 A1 | 20-01-2010 |
| | | | WO 2008135783 A1 | 13-11-2008 |
| WO 2008135775 | A1 | | US 2009240088 A1 | 24-09-2009 |
| EP 2070881 | A1 | 17-06-2009 | AU 2008243273 A1 | 04-06-2009 |
| | | | EP 2060544 A1 | 20-05-2009 |
| | | | JP 2009183936 A | 20-08-2009 |
| | | | US 2009137015 A1 | 28-05-2009 |

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Annex B).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, International Phase, paragraph 296).

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet or sheets containing a complete set of claims in replacement of all the claims previously filed must be submitted.

Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively in Arabic numerals (Section 205(a)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments and any accompanying statement, under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the time of filing the amendments (and any statement) with the International Bureau, also file with the International Preliminary Examining Authority a copy of such amendments (and of any statement) and, where required, a translation of such amendments for the procedure before that Authority (see Rules 55.3(a) and 62.2, first sentence). For further information, see the Notes to the demand form (PCT/IPEA/401).

If a demand for international preliminary examination is made, the written opinion of the International Searching Authority will, except in certain cases where the International Preliminary Examining Authority did not act as International Searching Authority and where it has notified the International Bureau under Rule 66.1bis(b), be considered to be a written opinion of the International Preliminary Examining Authority. If a demand is made, the applicant may submit to the International Preliminary Examining Authority a reply to the written opinion together, where appropriate, with amendments before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later (Rule 43bis.1(c)).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see the *PCT Applicant's Guide*, National Chapters.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day month year) see form PCT/ISA 210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION See paragraph 2 below

International application No.
PCT/IB2009/007443

International filing date (day month year)
28.10.2009

Priority date (day month year)
30.10.2008

International Patent Classification (IPC) or both national classification and IPC
INV. C12P7/10 C12P19/14 B01F3/12 B01F5/04 C12M1/40 C13K1/06

Applicant
PURSUIT DYNAMICS PLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA



European Patent Office
Gitschiner Str. 103
D-10958 Berlin
Tel +49 30 25901 - 0
Fax +49 30 25901 - 840

Date of completion of
this opinion

see form
PCT/ISA 210

Authorized Officer

Schröder, Gunnar

Telephone No +49 30 25901-326



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/IB2009/007443

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - ☐ on paper
 - ☐ in electronic form
 - b. (time)
 - ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. II Priority

1. ☐ The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43bis.1 and 64.1) is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/IB2009/007443

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|--|
| Novelty (N) | Yes: Claims | <u>20-44, 50-56, 61, 62, 70, 71, 74</u> |
| | No: Claims | <u>1-19, 45-49, 57-60, 63-69, 72, 73</u> |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | <u>1-74</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-74</u> |
| | No: Claims | |

2. Citations and explanations

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rules 43bis.1 and 70.10)

and / or

2. Non-written disclosures (Rules 43bis.1 and 70.9)

see form 210

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item II

Priority

The claimed priority with the priority date of 30.10. 2008 is considered to be valid since the contents of the application are fully supported by the priority document US 2/290,700.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 GB 1 028 211 A (ESCHER WYSS GMBH) 4 May 1966 (1966-05-04) ; & GB 995 660 A (ESCHER WYSS GMBH) 23 June 1965 (1965-06-23)
- D2 WO 2006/010949 A1 (PURSUIT DYNAMICS PLC [GB]; FENTON MARCUS BRIAN MAYHALL [GB]; WALLIS AL) 2 February 2006 (2006-02-02)
- D3 Cincotta, Bruce: "From the lab to production:direct steam injection heating of fibrous slurries"BIOMASS MAGAZINE 1 July 2008 (2008-07-01) , XP002593580Retrieved from the Internet:URL:http://www.pro-sonix.com/files/Heating_of_Fibrous_Slurries_-_Biomass_Magazine_-_Hyp_0708.pdf [retrieved on 2010-07-22]
- D4 US 4 201 596 A (BURROUGHS REGINALD L [US] ET AL) 6 May 1980 (1980-05-06)
- D5 US 2003/147301 A1 (EKHOLM ROLF [SE]) 7 August 2003 (2003-08-07)
- D6 RU 2 152 465 C1 (KAZAKOV VLADIMIR MIKHAJLOVICH) 10 July 2000 (2000-07-10)
- D7 KHANAL SAMIR KUMAR ET AL: "Ultrasound enhanced glucose release from corn in ethanol plants"BIOTECHNOLOGY AND BIOENGINEERING, vol. 98, no. 5, December 2007 (2007-12) , pages 978-985, XP002593581ISSN: 0006-3592

- D8 DATABASE FSTA [Online] INTERNATIONAL FOOD INFORMATION SERVICE (IFIS), FRANKFURT-MAIN, DE; 1984 , HAGEN H A: "Energy economy by continuous steaming and mashing. (translated) TIOL-Einsparung von Energie durch kontinuierliches Daempfen/Maischen." XP002593582 Database accession no. FS-1984-01-H-0193 ; & BRANNTWEINWIRTSCHAFT, vol. 122, no. 18, 1982, pages 282-284,
- 1 The present application does not meet the criteria of Article 33(1) PCT, because the subject - matter of claims 1-5, 13-19, 45-47 is not new in the sense of Article 33(2) PCT.
- 1.1 The document D1 (GB 1,028,211) discloses (the references in parentheses applying to this document):
- A process for the treatment of a starch -based feedstock (page 1, lines 8-20), comprising:
- (a) inducing a composition comprising biomass (starch, or a starch based feedstock) and a working fluid (water) to flow into a passage of a fluid processing apparatus (Figure 1, vessel 4; page 2, lines 7-22; example 1, page 3, lines 24-25);
- (b) injecting a high velocity transport fluid (pressurized steam) into the composition, thereby imposing high stress due to impacting and shearing forces (page 2, lines 13-22);
- (d) transferring the composition to a first holding vessel (reaction vessel 61, Figure 1 and page 2, lines 33-37);
- (e) holding the composition in the first holding vessel at a predetermined temperature for a predetermined time (page 2, lines 33-43 and 63-68; example 1),
- wherein a liquefaction enzyme (alpha-amylase) is added to the composition prior to step (a) (page 2, lines 13-22; example 1, page 3, lines 16-24);
- The document GB 995,660 is cited in the document and is said to disclose the apparatus suitable for carrying out the above step (b) of the process (see page 1, lines 22-32).
- GB 995,660 discloses:

An apparatus for injecting a high velocity transport fluid into a starch slurry through a nozzle communicating with the passage of a starch activation device (page 2, lines 9-50 and claims 1-3).

The further described features in steps (b) and (c) of claim 1 (atomisation, vapour and droplet flow regime, condensation) are considered to be the result of applying the injection of pressurized steam into the biomass slurry, as disclosed in document D1, and are thus regarded to be an implicit feature of the process of document D1.

The subject-matter of claims 1-5 and 45-47 is therefore not new.

- 1.2 The features of dependent claims 13-19 are also disclosed in document D1 (document GB 1,028,211), see passages cited in the search report. Namely, the second holding vessel corresponds to vessel 16 in Figure 1 and the second fluid processing apparatus corresponds to reaction vessel 10 in Figure 1 (see also page 2, line 69-115). The second enzyme is for example a thermophilic carbohydrase (page 2, lines 69-77). The temperature for the second enzymatic hydrolysis step is exemplified to be 60-70 °C (Example 1; page 3, line 40) or 40-60 °C (Example 2; page 3, line 65-68).

The subject-matter of claims 13-19 is therefore not new.

- 2 Documents D2 and D3 (passages cited in the search report) disclose further methods for treating biomass by steam injection. These documents will be used to discuss the presence of an inventive step further below.
- 2.1 Document D2 discloses a method and apparatus for mixing and homogenizing fluids by direct steam injection. The apparatus is said to be suitable for pretreating biomass for subsequent bioethanol production, and it is said to be suitable for use in an enzymatic hydrolysis process without damage to the enzymes (page 47, line 28 - page 48, line 32).
- 2.2 Document D3 is an article wherein there are highlighted the advantages of direct steam injection as a pretreatment method for the conversion of biomass into sugar and bioethanol. In particular, the advantage of a high velocity steam injection at sonic velocity to achieve "choked flow" for optimum biomass pretreatment is described (see last page of D3).
- 3 The subject-matter of claims 6-12, 20-44 and 48-74 is not considered to involve an inventive step in the sense of Article 33(3) PCT.

- 3.1 Dependent claims 6-12 and 20-44 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

Concerning claims 6-12 and 20-23, the following is noted. Document D1 suggests to use, in addition to an amylase, a carbohydrase (page 2, lines 69-77). It is obvious that the order in which the enzymes are added, depending on the nature of the substrate, may be inversed, and that, depending on which specific enzyme is used, a different (lower) temperature may be selected. Also, it is an obvious variant to add both enzymes together, and to shift temperatures at a second stage in order to activate the enzyme which requires the higher temperature to become active. Finally, as exemplified in the method of document D8 (abstract), it is known to the skilled person that the amylase treatment may be carried out at different (lower) temperatures, especially if several treatment steps are carried out consecutively.

Further modifications of the process (claims 24-44) seem to be slight constructional changes which come within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen.

- 3.2 Document D1 discloses a system for the treatment of a composition comprising biomass from which the subject-matter of claim 48 differs in that the nozzle does not comprise a throat portion whose cross-sectional area is less than that of the outlet, and that the system comprises a fermentation vessel in addition. These differences are seen as marginal, the design of the nozzle shape being a small constructional difference which comes within the scope of the practitioner, and the inclusion of a fermentation vessel being obvious since the skilled person is well aware that a non-chemical pretreatment and saccharification method such as the one disclosed in D1 is a suitable first step in an overall biomass-to-product process wherein sugars obtainable from biomass are further converted into useful products such as ethanol by fermentation.
- 3.3 Similarly, the further features of the system according to claims 49-74 are either disclosed, implicitly disclosed or suggested in document D1, or these features are seen as obvious modifications or extensions of the process and system disclosed in document D1 (documents GB 1,028,211 and GB 995,660).

- 3.4 It is considered that documents D2 and D3, although not explicitly disclosing the claimed process and system with all features, directly lead the skilled person to a process according to claims 1-5 and 45-48. In addition, document D2 leads the skilled person to a process according to claim 6 (reasons, see above) and claim 12, since it is stressed that the process conditions are compatible with enzymatic hydrolysis without damaging the enzymes (page 47, line 28 - page 48, line 32). Also, the design of a system for biomass treatment according to claims 48, 49, 57, 58, 63, 64, 72 and 73 is obvious in the view of document D2.

Re Item VI

Certain documents cited

| Application No Patent No | Publication date (day/month/year) | Filing date (day/month/year) | Priority date (valid claim) (day/month/year) |
|-----------------------------|--------------------------------------|---------------------------------|---|
| WO2008/135783 | 13/11/2008 | 02/05/2008 | 1. 02/05/2007 2. 05/06/2007 |
| WO2008/135775 | 13/11/2008 | 21/03/2008 | 1. 02/05/2007 2. 05/06/2007 |
| EP2070881 | 17/06/2009 | 17/11/2008 | 16/11/2007 |

The above documents (passages cited in the search report) disclose the subject-matter of the following claims:

WO2008/135783: claims 1-5, 12, 45-49, 57-60, 63-69, 72, 73

WO2008/135775: claims 1-11, 13, 16, 45-49, 57-60, 63-69, 72, 73

EP2070881: claims 1-5, 45-49, 57, 58, 63, 64, 72, 73

Re Item VIII

Certain observations on the international application

- 1 Claim 1 is not supported by the description as required by Article 6 PCT, as its scope is broader than justified by the description.

Claim 1 describes a process for the treatment of biomass, in which a "working fluid" and a "transport fluid" are utilized in an apparatus comprising a "passage". The claimed subject-matter encompasses *any* kind of biomass, *any* kind of fluids and *any* kind of passage, whereas support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT has been given only for *water* as the working fluid and *steam* as the transport fluid. It is not obvious what other kinds of fluids could be suitable for the claimed process. Thus, said claim is not supported and disclosed over its whole breadth.

- 2 In claim 1 an attempt is made to define the method by reference to a result to be achieved. Article 6 in conjunction with Rule 6.3 (a) requires that all the essential features of the claimed invention have to be indicated in the claim in technical terms. Claims which attempt to define the invention by a result to be achieved should not be allowed, in particular if they only amount to claiming the underlying technical problem. The description (e.g. paragraph 0088) conveys the impression that the effects described in claim 1 can only be achieved when steam is applied at a very high velocity, which needs to be defined clearly in order for the claim to be clear (it is noted that the expression "very high" is a relative expression which is not clear; a "supersonic velocity" may in contrast be viewed as a clear definition since the lower limit is a clearcut value).

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

| | |
|---|---|
| General information | For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities. |
| Amending claims under Art. 19 PCT | Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220. |
| Filing a demand for international preliminary examination | <p>In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/ WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT).</p> <p>If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).</p> |
| Filing informal comments | After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box. |
| End of the international phase | At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report). |
| Relevant PCT Rules and more information | Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003 |